Gophers: Socially Oriented Pervasive Gaming

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ABSTRACT

Gophers is an open-ended gaming environment which relies on location data, user generated content and player interactions to shape gameplay. It seeks to investigate social collaboration within localised and distributed gaming communities, the potential of pervasive gaming as a technique to collect useful data about the physical world and additionally, use of novel peer-judging methods to allow self-governing of the game world. In this paper, we introduce the game in its current state and provide an overview of early test results.

Categories and Subject Descriptors

H.5.3 [**Information Interfaces and Presentation**]: Group and Organisation Interfaces – *computer-supported cooperative work.* I.2.6 [**Artificial Intelligence**]: Learning – *knowledge acquisition.* K.8.0 [**Computing Milieux**]: Personal Computing – *games.*

General Terms

Design, Experimentation, Human Factors.

Keywords

Pervasive, social, collaborative, mobile gaming, context, location, cell-id.

1. INTRODUCTION

Gophers explores the use of the mobile phone for providing a socially-oriented entertainment experience. The game is based on the Hitchers [6] platform, originally written as the basis of a game created at the University of Nottingham that utilised cell-ID location data to provide a digital hitchhiking experience. Hitchers introduced the notion of beings (hitchers) that jump onto a player's phone, interact with the player and then leave – using location information based upon cell mast id. Gophers extends this interaction, allowing agents (more personable gopher creatures) to be created and given complex tasks to perform with the help of other players. Furthermore, it adds a scoring/jury system based upon player performance, the ability to scale between large and small gaming groups, the notion of cyclic agent lifecycles and more engaging and varied interaction methods. The game aims to investigate the collection of useful data through play, storing both geographically tagged textural and photographic data.

2. PLAYER EXPERIENCE

The Gophers experience revolves around gopher agents that have been given a specific task or mission to perform. A gopher is best considered as a physical item which can be found, picked up and dropped. When not residing on a cell-phone, these entities live at an approximate location in the real world, denoted by a cell mast coverage area. They remain at this location until being picked up or summoned.

Figure 1. A player pauses to photograph their situation

2.1 Play Overview

The gameplay goal for participating players is to score as many points as possible. There is a publicly accessible Gophers website displaying a live leader-board, through which players can rank their performance against others.

An in game economy, based on points, encourages players to engage in the game. Players need to accumulate enough points to create their own gophers. Points are awarded for the following actions: creating a gopher that goes on to complete its mission, helping someone else's gopher in its mission, playing the Gopher Guessing Game, participating in Jury Service, and moving around the physical world. Two other interactions with Gophers are also possible, specifically providing gophers with gossip and supplying images of their current surroundings. These result in an engaging dialogue with the gopher (rather than points) that is, in itself a reward. Below, player-gopher interactions are described in further detail:

Gopher Creation: A player creates a Gopher by paying a set number of points and providing it with a name, image (what the agent looks like) and task for it to accomplish. The task is a statement assigned to the gopher, which must be satisfied through

the help of player interactions. Although the player decides the nature of the tasks, completion of them will rely on the mediums of photos, text input and location data.

Guessing Game: Gophers can play a location sensitive word-guessing game with their hosts, where players provide a word describing their current location. If the word has previously been entered near their location, the player and all other players who entered the word will receive points.

Photo Album: Allows user to take photos using their phone and supply them to the Gopher. Photos are tagged with the user's current location and held in the gopher's blog. The gopher responds by showing a photo it has previously collected in a nearby location.

Gopher Gossip: A user can also pass a piece of gossip to the gopher (a single sentence). As with photos, the new gossip is location tagged and the gopher replies with a historical piece of gossip acquired nearby.

Gopher Assist: A gopher's task is completed in stages by (ideally several) players interacting with the agent and providing information related to the mission. Each time they can help, players supply the gopher with empirical evidence through an interaction (i.e. Gossip or a Photo). When a player believes the Gopher has fully completed its task, they submit it to be judged by Jury Service.

Jury Service: Players are selected for Jury Service to determine if a Gopher has completed its task and to reward participants with points. A player can determine the status of a gopher's task by browsing the gopher's online blog.

Walkabout: A final method whereby players can gain points is running the game in walkabout mode. In this non-interactive game phase, points are accrued every time the phone moves into a new cell-id coverage area.

3. KEY DESIGN DECISIONS

Throughout its life a gopher keeps track of any information it receives in the form of a blog. This can be interpreted as a storyboard that evolves as the gopher's narrative progresses. Besides containing information collected during the current task, blogs from previously assigned tasks are also available. It was observed in testing that players became attached to gophers and wanted them to exist after task completion; the cyclic lifecycle detailed below, allows for such gopher longevity.

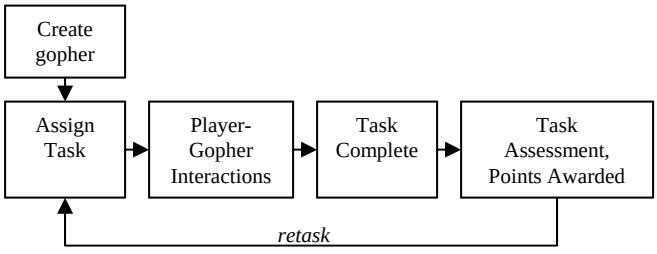

Figure 2. The cyclic gopher lifecycle

3.1 User Generated Content

A strong theme when designing the game was utilisation of user generated content. Gophers defines the environment/ constraints within which the game is played, whilst users supply the narrative and game content – a truly open ended approach, which is less expensive or restrictive than use of predefined game content and promotes game ownership by players. Nevertheless, it is important that users do contribute this content, to ensure interesting gameplay; tests indicate that players are more then willing to supply this.

3.2 Useful Data from Play

Projects such as *The ESP Game* [1], *Peekaboom* [2] and more recently Google's *Image Labeller* [7] have sparked mainstream interest in harnessing games for useful data collection. By design, Gophers aims to collect image and tag locations. Throughout a gopher's lifetime it collects a wealth of potentially useful data, in the form of geospatially and temporally linked photographs, descriptive tags and textual information. A visualisation tool to graphically display this data is under development (see Figure 3). The cyclic gopher lifecycle ensures this collection of knowledge is not lost after a mission is completed and instead, continues to grow with the game. This provides interesting content for the blogs and leads to a more engaging Gossip/Photo and Jury Service dialogue.

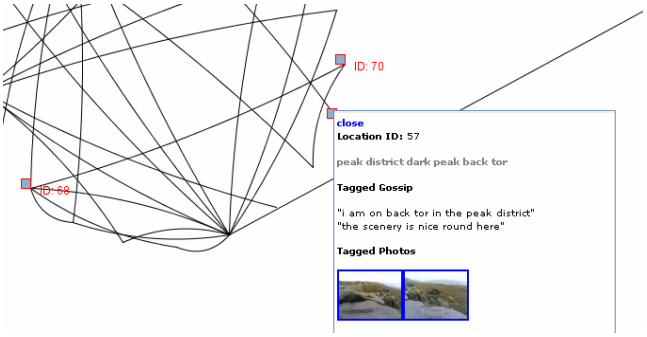

Figure 3. Visualisation of geospatial data

3.3 Technicalities of Guessing Game

The game design is based upon The ESP Game [1]. A player receives points for matching any previously guessed words within 5 hops of their cell-id (in similar manner to Hitchers' *Adaptive Search Method* [6]). Points are awarded in a 'dartboard' style, where the number awarded relate to the proximity of the matched word from the current location and number of times the word has been matched (the more a word is matched, the less points are awarded). This diminishing point system encourages both original and precise guessing. The game also employs anti-cheating mechanisms, which firstly prevent players guessing the same word in a similar location and secondly discourage players 'pairing up' to tactically enter the same guesses.

3.4 Task Assessment through Jury Service

Determining the success and perceived difficulty of a gopher's mission is a highly subjective matter. Resolving this is achieved through *Jury Service*. Jury service can be seen as a method of letting the gaming community self-orchestrate and moderate gameplay. A number of users (the last 5% to participate) are selected to act as a panel of jurors. They are instructed to visit a webpage, where the trial is held over a 24 hour period. After logging into the page, each juror is presented with the gopher's

blog and must independently decide whether the mission was completed, how difficult they perceived it to be and rank the users who helped the gopher most. Once the trial is finished, the gopher's creator is awarded credits relating to the mission difficulty and users who helped in the completion of the task are awarded credits relative to their juried ranking. To encourage participation and accuracy, judges are given credit for the consistency of their answers.

3.5 Retask/Recycle

Once assessment is complete, a gopher returns to the player who originally created them, for *retasking*. This process allows the player to assign a new task the gopher and re-release it. Retasking can also be initiated prematurely if the player wishes to alter the assigned task (for example, if a gopher reaches a point where no players can complete its task). A gopher retains all knowledge, previous tasks and results/points of those tasks; all which are viewable in its blog.

3.6 Retire

When a player tires of one of their created gophers and do not wish to retask, they are able to retire it. The gopher is removed from the game, but its blogs remain for reference.

3.7 Gopher Location

As players move, the Hitchers platform keeps track of cell-ids that are visited. *Walkabout mode* encourages player movement and in turn promotes the building of the node graph containing cell-phone mast ids (described in *Technical Details*).

3.8 Gopher Movement

Gophers can be found via a location-aware search program. The search returns a list ordered with respect to distance, measured in terms of the number of network hops to each gopher. This distance is reflected as an element of gameplay; when summoned, a more distant gopher will take longer and be more costly to pick up than a nearby one. The time taken is (10 minutes x number of hops) for connected cells, or 1 day for disconnected.

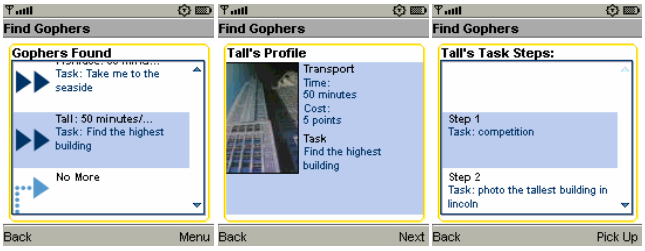

Figure 4. Finding a gopher and viewing its task

This presents the player with a trade-off between searching for nearby gophers, or being prepared to wait for a more desirable gopher to be transported. The key to this technique is it allows for players from 2 physically isolated gaming communities (on disconnected network graphs) to interact and can scale between sparse and dense player distribution, whilst retaining concept of distance. Through this, massively cross-cultural games could become possible. Once acquired, a player can interact with the gopher and help complete its tasks. When finished with the gopher, the player drops it off at the phone's real-world location, where it remains dormant until being summoned by another user.

4. TECHNICAL DETAILS

There is an emerging trend in pervasive games which make use of location data to draw the physical and digital worlds yet closer. Location-specific data has been used for a variety of purposes, such as determining relative and absolute locations [4], triggering gameplay events [5] and superimposing gaming environments over the real world [9]. In the case of gophers, location data is harnessed to determine relative world location between game items.

Numerous games, such as Savannah [4], employ GPS to provide location data. GPS is an established system for high accuracy location data, but unusable for use indoors or in dense city environments. Furthermore, purchasing GPS modules for mobile phones is prohibitively expensive and in our situation, unnecessary. We elect to use mobile phone cell mast positioning, since only coarse location accuracy is required and it offers a cost-free solution which is available on mobile phones without modification.

4.1 Cell Masts for Location Positioning and Distance Estimation

Each cell mast has a unique id. The mobile phone (Nokia series 60 in our case) is able to freely read the identifier of the mast to which it is currently connected [6],[8]. This unique identifier can be used to associate gophers, game events and data to a physical location. Additionally, as players move around in the physical world and encounter new masts, they contribute to a dynamically evolving server side graph of interconnected cell masts. Through analysis of this graph, it is possible to approximate the number of hops (and therefore relative distance) between locations.

5. PRELIMINARY TEST AND DISCUSSION

A preliminary proof of concept 4 day technical test was run between the 20th and 23rd June, where an early release of the game was trialled on various models of Nokia Series 60 phone. These were distributed to both technical and non-technical players. The exercise was designed as an initial test to assess usability of interface, effectiveness of gameplay mechanics and reliability of the software. Prior to the trial, players were given a set of instructions and short introduction to playing the game. Each was given 500 points to create gophers and some introductory gophers were artificially created, to stimulate the gameplay. Afterwards, players were interviewed and questionnaires completed according to the responses. Through analysis of questionnaires, a number of points of interest were noted:

(i) Technical Issues: Technical bugs existed, which caused crashing and unexpected behaviour at certain points.

(ii) Hoarding Gophers: Some players held large collections of gophers on their phones and would either forget about them, or be reluctant to drop them. This prevents gophers completing missions and leads to less interesting mission logs and a reduced collection of knowledge. Restricting the number of gophers a

player can hold and introduction of a 'boredom threshold' intend to reduce this.

(iii) Lack of Feedback: If a player received no feedback or reward, they were less interested in utilising certain game elements. In particular the guessing game (guesses were rarely matched as the word database was too small) and gossip (insufficient gossip was collected during a gopher's lifetime to provide player with feedback). This led to an overhaul of the guessing game, which previously only considered words at the current cell-id and the concept of retasking gophers to allow for larger knowledge base.

(iv) Gameplay Concepts: Some players did not understand the concept of dropping gophers; responses such as *"I don't want someone taking credit for my gopher…"* and *"Do I lose a gopher when dropping it?"* were noted.

(v) Social Collaboration: Playing gophers increased social collaboration outside of the game. One player and her boyfriend played the game together for example, while another discussed game tactics with a group of friends.

(vi) Need for Complex Tasks: Tasks assigned during testing tended to vary broadly, between entertaining challenges to more meaningful data collecting missions. Examples included *"Collect photos of dogs before Thursday"* and *"Take photos from high buildings"*. Users found creation of tasks to be one of the most enticing gameplay aspects. Originally, these were restricted to a single line descriptor, which resulted in some slightly ambiguous descriptions and constrained the variety and complexity of conceivable tasks. This led us to allow for more intricate tasks (possibly requiring some 'detective work') by enabling users to define sets of subtasks or *steps*.

(vii) Evidence of Cheating: Opportunistic players will use any method to win! There was evidence of players copying guessed words from blogs to succeed in the guessing game.

These issues are being used to inform the on-going design and development of Gophers and further studies are currently being prepared.

5.1 Reflection on the Seams in Hitchers and Gophers

The use of cell-ids appears an unrealistic measure of travel time; rural areas only receive sparse coverage of mobile phone masts, whereas urban areas are densely packed with transmitters [8]. Alternatively, this could be interpreted as an exploitable seam [3],[6], where urban gophers take longer to travel the same physical distance than country dwelling gophers. This is synonymous to the real world, where travelling around congested city streets is a far more time consuming process than cross country travel.

Further technological seams were revealed through testing; it emerged that through turning their phone off, a player is able to capture their gophers in a state of hibernation. Their collection of gophers is retained on their phone, without them becoming bored and escaping.

Mast flipping [6] (the phenomenon of a phone switching between overlapping cells) affected operation of game elements, particularly the guessing game. Originally, the game was designed to match players responses to words guessed previously in the current cell. Flipping meant that two players could guess in the same location but be connected to different masts. This led to some frustrating results in the initial tests and the game was redesigned around this seam, utilising the revised dartboard method (described in *Game Design*). This introduces an element of luck into the game, with players attempting to overcome the flipping and score a 'bullseye'.

6. CONCLUSION

Full scale trials of the revised game are now under preparation. The first will take place in and around the city of Lincoln over the coming weeks. This will assess the gameplay mechanics and data collection possibilities on a larger scale. Further tests are planned in which the game will be rolled-out to the general public via a web download. This will allow the game to reach a larger user base more widely distributed around the country, where the gameplay is designed to naturally flourish.

6.1 Workshop Outcomes

In participating in the workshop, we hope to ascertain future directions and uses for the research findings. It will also be worthwhile to conduct a critique of the gameplay mechanics. If time and facilities permit, the workshop would also provide the ideal setting for a small-scale trial of the game.

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